

PATRICK F. DOBSON

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EDUCATION

Stanford University, Stanford, CA

Ph.D. Geology (1986)

Dissertation: *The petrogenesis of boninite: A field, petrologic and geochemical study of the volcanic rocks of Chichi-jima, Bonin Islands, Japan.*

MS Geology (1984)

Thesis: *Volcanic stratigraphy and geochemistry of the Los Azufres geothermal center, Mexico*

Williams College, Williamstown, MA

BA Geology (*magna cum laude*) (1981)

WORK HISTORY

Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley CA

2010-present **Career Geological Staff Scientist**

2003-2010 **Career Geological Research Scientist**

2000-2003 **Geological Scientist**

Office of Basic Energy Sciences, US Department of Energy, Germantown MD

2007-2009 **Deputy Program Manager, Geosciences Program** (on detail from LBNL)

1999-2001 **Consultant, Empresa Nacional del Petroleo (ENAP)**, Santiago Chile

Unocal Geothermal & Power Operations, Unocal Corporation, Santa Rosa CA

1998-1999 **Advising Geologist**

1994-1998 **Senior Geologist**

Unocal Science & Technology Division, Unocal Corporation, Brea CA

1989-1994 **Research Geologist**

Department of Geological Sciences, University of California, Santa Barbara CA

1989 **Postdoctoral Research Fellow**

Division of Geological & Planetary Sciences, California Institute of Technology, Pasadena CA

1986-1989 **Postdoctoral Research Fellow**

AREAS OF SCIENTIFIC INVESTIGATION

Water-rock interaction related to geothermal systems and high-level radioactive waste repositories; Development of conceptual models for geothermal systems through integration of geologic, geochemical and geophysical data; Application of natural analogues to evaluate radionuclide transport for nuclear waste repositories; Igneous petrology; Geologic evaluation of petroleum systems; Stable isotope geochemistry

TECHNICAL EXPERTISE

Field: Geological field mapping, sampling of rocks, waters, and gases associated with exploration for geothermal systems, rigsite geology and core logging.

Computational: Coupled process modeling of hydrothermal systems using TOUGHREACT.

Laboratory: Isotope exchange reaction experiments, geochemical and isotopic analysis of geologic samples (rocks, minerals, fluids, gases) using electron microprobe, XRD, XRF, mass spectrometry, petrographic analysis and interpretation of thin sections.

Project Management: Planning and managing budgets and staff, assuring projects meet milestones, and overcoming technical and logistical challenges to meet project objectives in a timely and cost-effective manner.

SOME RECENT SYNERGISTIC ACTIVITIES AND PROFESSIONAL SERVICE

- Panelist, *Geothermal Best Practices for Risk Reduction Workshop*, organized by U.S. Department of State and Geothermal Energy Association (2014)
- Speaker, *Geothermal Energy Transformations: Nationwide Resources and Value Chains*, Energy from the Earth Briefing Series, Washington, D.C. (2014)
- Member, Editorial Board, *Geothermics* (2009-present)
- Member, DOE Geothermal Technologies Program Technical Monitoring Teams, *Enhanced Geothermal Systems and Innovative Exploration Technologies* (2009-present)
- Leader, Field trip to The Geysers geothermal field, AAPG Hedberg Conference on Enhanced Geothermal Systems (2011)
- Reviewer: *Geothermics*, *Nature Geoscience*, *Environmental Earth Sciences*, *Geophysical Research Letters*, *Geothermal Energy Science*, *Geothermal Resources Council Transactions*, *DOE Geothermal Technologies Program Peer Review*
- Invited visit to Santiago, Chile, Energy and Climate Partnership of the Americas initiative (US-Chile), with six lectures to government, industry, and academic audiences (2011)
- Participant, DOE Geothermal Technologies Program, *Innovative Exploration Technologies Needs Assessment Workshop* (2010)
- Student advisor, Berkeley Lab Internship for Precollegiate Scholars (2010)

- Organized 3 DOE Basic Energy Sciences workshops: *Computational and numerical geosciences*, *Basic research relevant to geological CO₂ sequestration*, and *Experimental and theoretical geochemistry* (2007-2009)

AWARDS

SPOT Awards (5), Lawrence Berkeley National Laboratory	2002, 2006, 2014, 2015
Geothermal Special Achievement Award, Geothermal Resources Council	2012
Fulbright Specialist Grant in Environmental Science, University of Chile	2012
Outstanding Contributions in Geosciences Research Award, DOE Basic Energy Sciences	2009
Special Recognition Awards (3), Unocal Corporation	1995, 1998
Fred L. Hartley Research Center Creativity Award, Unocal Corporation	1992
Harold T. Stearns Fellowship, Geological Society of America	1984
Exxon Teaching Fellowship, School of Earth Sciences, Stanford University	1982-1985
Phi Beta Kappa, Williams College Chapter	1980

CURRENT PROFESSIONAL MEMBERSHIPS

American Geophysical Union, Geological Society of America, Geothermal Resources Council, Geological Society of Washington

PUBLICATIONS

JOURNAL ARTICLES

1. Jeanne, P., Rutqvist, J., Dobson, P.F., Walters, M., Hartline, C., and Garcia, J. (2014). The impacts of mechanical stress transfers caused by hydromechanical and thermal processes on fault stability during hydraulic stimulation in a deep geothermal reservoir. *International Journal of Rock Mechanics and Mining Sciences* **72**, 149–163.
2. Jeanne P., Rutqvist J., Hartline, C., Garcia J., Dobson P.F., and Walters M. (2014). Reservoir structure and properties from geomechanical modeling and microseismicity analyses associated with an enhanced geothermal system at The Geysers, California. *Geothermics* **51**, 460–469.
3. Jeanne P., Rutqvist J., Vasco, D., Garcia J., Dobson P.F., Walters M., Hartline, C., and Borgia, A. (2014). A 3D hydrogeological and geomechanical model of an Enhanced Geothermal System at The Geysers, California. *Geothermics* **51**, 240–252.
4. Rutqvist, J., Dobson, P.F., Garcia, J., Hartline, C., Jeanne, P., Oldenburg, C.M., Vasco, D.W., and Walters, M. (2014) The Northwest Geysers EGS demonstration project, California: Pre-stimulation modeling and interpretation of the stimulation. *Mathematical Geosciences*, DOI 10.1007/s11004-013-9493-y.
5. Vasco, D.W., Rutqvist, J., Ferretti, A., Rucci, A., Bellotti, F., Dobson, P., Oldenburg, C., Garcia, J., Walters, M., and Hartline, C. (2013) Monitoring deformation at the Geysers Geothermal Field, California using C-band and X-band interferometric synthetic aperture radar. *Geophys. Res. Lett.* **40**, 1–6, doi:10.1002/grl.50314.
6. Finsterle, S., Zhang, Y., Pan, L., Dobson, P., and Oglesby, K. (2013) Microhole arrays for improving heat mining from enhanced geothermal systems. *Geothermics* **47**, 104-115.

7. Oldenburg, C.M., Doughty, C., Peters, C.A., and Dobson, P.F. (2012) Simulations of long-column flow experiments related to geologic carbon sequestration: Effects of outer wall boundary condition on upward flow and formation of liquid CO₂. *Greenhouse Gases Sci. Technol.* **2**, 279–303.
8. Dobson, P.F., Ghezzehei, T.A., Cook, P.J., Rodriguez-Pineda, J.A., Villalba, L., and de la Garza, R. (2012) Heterogeneous seepage at the Nopal I natural analogue site, Chihuahua, Mexico. *Hydrogeol. J.* **20**, 155–166.
9. Goldstein, S.J., Abdel-Fattah, A.I., Murrell, M.T., Dobson, P.F., Norman, D.E., Amato, R.S., and Nunn, A.J. (2010) Uranium-series constraints on radionuclide transport and groundwater flow at the Nopal I uranium deposit, Sierra Peña Blanca, Mexico. *Environ. Sci. Tech.* **44**, 1579–1586.
10. Ku, T.L., Luo, S., Goldstein, S.J., Murrell, M.T., Chu, W.L., and Dobson, P.F. (2009) Modeling non-steady state radioisotope transport in the vadose zone – A case study using uranium isotopes at Peña Blanca, Mexico. *Geochim. Cosmochim. Acta* **73**, 6052–6064.
11. Blank, J.G., Green, S.J., Blake, D., Valley, J.W., Kita, N.T., Treiman, A., and Dobson, P.F. (2009) An alkaline spring system within the Del Puerto Ophiolite (California, USA): A Mars analog site. *Planet. Space Sci.* **57**, 533–540.
12. Dobson, P.F., Fayek, M., Goodell, P., Ghezzehei, T.A., Melchor, F., Murrell, M.T., Oliver, R., Reyes-Cortés, I., de la Garza, R., and Simmons, A. (2008) Stratigraphy of the PB-1 well, Nopal I uranium deposit, Sierra Peña Blanca, Chihuahua, Mexico, *Internat. Geol. Rev.* **50**, 959–974.
13. Dobson, P.F., Blank, J.G., Maruyama, S., and Liou, J.G. (2006) Petrology and geochemistry of boninite series volcanic rocks, Chichi-jima, Bonin Islands, Japan, *Internat. Geol. Rev.* **48**, 669–701.
14. Verma, S.P., Torres-Alvarado, I.S., Satir, M., and Dobson, P.F. (2005) Hydrothermal alteration effects in geochemistry and Sr, Nd, Pb, and O isotopes of magmas from the Los Azufres geothermal field (Mexico): A statistical approach. *Geochem. Jour.* **39**, 141–163.
15. Dobson, P.F., Salah, S., Spycher, N., and Sonnenthal, E. (2004) Simulation of water-rock interaction in the Yellowstone geothermal system using TOUGHREACT. *Geothermics* **33**, 493–502.
16. Hickman, R.G., Dobson, P.F., van Gerven, M., Sagala, B., and Gunderson, R.P. (2004) Tectonic and stratigraphic evolution of the Sarulla Graben region, North Sumatra, Indonesia. *J. Asian Earth Sci.* **23**, 435–448.
17. Dobson, P.F., Kneafsey, T.J., Hulen, J., and Simmons, A. (2003) Porosity, permeability, and fluid flow in the Yellowstone geothermal system, Wyoming. *J. Volcanol. Geotherm. Res.* **123**, 313–324.
18. Dobson, P.F., Kneafsey, T.J., Sonnenthal, E.L., Spycher, N., and Apps, J.A. (2003) Experimental and numerical simulation of dissolution and precipitation: Implications for fracture sealing at Yucca Mountain, Nevada. *J. Contam. Hydrol.* **62–63**, 459–476.
19. Moore, D.E., Hickman, S., Lockner, D.A., and Dobson, P.F. (2001) Hydrothermal minerals and microstructures in the Silangkitang geothermal field along the Great Sumatran fault zone, Sumatra, Indonesia. *Geol. Soc. Amer. Bull.* **113**, 1179–1192.
20. Dobson, P.F., Skogby, H., and Rossman, G.R. (1995) Water in boninite glass and coexisting orthopyroxene: concentration and partitioning. *Contrib. Mineral. Petrol.* **118**, 414–419.
21. Cousens, B.L., Spera, F.J., and Dobson, P.F. (1993) Post-eruptive alteration of silicic ignimbrites and lavas, Gran Canaria, Canary Islands: Strontium, neodymium, lead, and oxygen isotopic evidence. *Geochim. Cosmochim. Acta* **57**, 631–640.
22. Dobson, P.F., Epstein, S., and Stolper, E.M. (1989) Hydrogen isotope fractionation between coexisting vapor and silicate glasses and melts at low pressure. *Geochim. Cosmochim. Acta* **53**, 2723–2730.
23. Banner, J.L., Wasserburg, G.J., Dobson, P.F., Carpenter, A.B., and Moore, C.H. (1989) Isotopic and trace element constraints on the origin and evolution of saline groundwaters from central Missouri. *Geochim. Cosmochim. Acta* **53**, 383–398.
24. Dobson, P.F., and O'Neil, J.R. (1987) Stable isotope compositions and water contents of boninite series volcanic rocks from Chichi-jima, Bonin Islands, Japan. *Earth Planet. Sci. Lett.* **82**, 75–86.
25. Dobson, P.F., and Mahood, G.A. (1985) Volcanic stratigraphy of the Los Azufres geothermal area, Mexico. *J. Volcanol. Geotherm. Res.* **25**, 273–287.

BOOK CHAPTERS

1. Dobson, P.F., and Tilton, G. (1989) Th, U and Pb systematics of boninite series volcanic rocks from Chichi-jima, Bonin Islands, Japan. In: Boninites, A.J. Crawford, ed., Unwin Hyman Ltd, London, 396–415.

OTHER PUBLICATIONS

1. Young, K.R., Wall, A.M., Dobson, P.F., Bennett, M., and Segneri, B. (2015) Measuring impact of U.S. DOE Geothermal Technologies Office Funding: Considerations for development of a geothermal resource reporting metric. *Proceedings World Geothermal Congress 2015*, Melbourne, Australia, 19-25 April 2015, 15 p.
2. Dobson, P.F., Kennedy, B.M., Conrad, M.E., McLing, T., Mattson, E., Wood, T., Cannon, C., Spackman, R., van Soest, M., and Robertson, M. (2015) He isotopic evidence for undiscovered geothermal systems in the Snake River Plain. *Proceedings, 40th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 26-28, 2014, 7 p.
3. Kneafsey, T.J., Nakagawa, S., Dobson, P.F., and Kennedy, B.M. (2015) Fracture sustainability in EGS systems – Results of laboratory studies. *Proceedings, 40th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 26-28, 2014, 9 p.
4. Jeanne, P., Rinaldi, A.P., Rutqvist, J., and Dobson, P.F. (2015) Seismic and aseismic deformations occurring during EGS stimulation at The Geysers: Impact on reservoir permeability. *Proceedings, 40th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 26-28, 2014, 13 p.
5. Nielson, D.L., Shervais, J., Evans, J., Liberty, L., Garg, S.K., Glen, J., Visser, C., Dobson, P., Gasperikova, and E., Sonnenthal, E. (2015) Geothermal play fairway analysis of the Snake River Plain, Idaho. *Proceedings, 40th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 26-28, 2014, 9 p.
6. Wood, T.R., Worthing, W., Cannon, C., Palmer, C., Neupane, G., McLing, T., Mattson, E., Dobson, P.F., and Conrad, M. (2015) The Preston geothermal resources; Renewed interest in a known geothermal resource area. *Proceedings, 40th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 26-28, 2014, 14 p.
7. Long, J.C.S., Feinstein, L.C., Birkholzer, J., Jordan, P., Houseworth, J., Dobson, P.F., Heberger, M., and Gautier, D.L. (2015) An Independent Scientific Assessment of Well Stimulation in California. Volume I. Well Stimulation Technologies and their Past, Present, and Potential Future Use in California. California Council on Science and Technology and Lawrence Berkeley National Laboratory, 367 p.
8. Cannon, C., Wood, T., Neupane, G., McLing, T., Mattson, E., Dobson, P., and Conrad, M. (2014) Geochemistry sampling for traditional and multicomponent equilibrium geothermometry in southeast Idaho. *Geothermal Resources Council Transactions*, **38**, 425-431.
9. Dobson, P. (2014) Chapter 4: Prospective Application of Well Stimulation Technologies in California. In: Advanced Well Stimulation Technologies in California – An Independent Review of Scientific and Technical Information. California Council on Science and Technology, Lawrence Berkeley National Laboratory, and Pacific Institute, pp. 121-179.
10. Jeanne, P., Rutqvist, J., Vasco, D., Garcia, J., Dobson, P.F., Walters, M., Hartline, C., and Borgia, A. (2014) Development of a 3D hydrogeological and geomechanical model of an Enhanced Geothermal System using microseismic and ground deformation data from a 1-year injection program. *Proceedings, 39th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 24-26, 2014.
11. Kneafsey, T.J., Nakagawa, S., Dobson, P.F., Kennedy, B.M., Icenhower, J.P., and Nakashima, S. (2014) Sustainability of Fractures in EGS Systems – A Laboratory Investigation. *Proceedings, 39th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 24-26, 2014.
12. Rutqvist, J., Dobson, P.F., Jeanne, P., Oldenburg, C.M., Vasco, D.W., Garcia, J., Hartline, C., and Walters, M. (2013) Modeling and monitoring of deep injection at the Northwest Geysers EGS demonstration, California. *Proceedings of the 47th U.S. Rock Mechanics / Geomechanics Symposium*, San Francisco, USA, June 23-26, 2013: American Rock Mechanics Association, Paper No. 13-307.

13. Perry, F.V., Dobson, P.F., and Kelley, R.E. (2013) Assessment of alternative host-rock distribution in the U.S. using GIS. *International High-Level Radioactive Waste Management Conference 2013*, Albuquerque, NM, April 28 – May 2, 2013, American Nuclear Society 85–93.
14. Dobson, P.F., Kennedy, B.M., Reich, M., Sanchez, P., and Morata, D. (2013) Effects of volcanism, crustal thickness, and large scale faulting on the He isotope signatures of geothermal systems in Chile. *Proceedings, 38th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 11-13, 2013.
15. Jung, Y., Xu, T., Dobson, P.F., Chang, N., and Petro, M. (2013) Experiment-based modeling of geochemical interactions in CO₂-based geothermal systems. *Proceedings, 38th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 11-13, 2013.
16. Rutqvist, J., Dobson, P.F., Garcia, J., Hartline, C., Oldenburg, C.M., Vasco, D.W., and Walters, M. (2013) Pre-stimulation coupled THM modeling related to the northwest Geysers EGS demonstration project. *Proceedings, 38th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 11-13, 2013.
17. Petro, M., Zesch, J., Chang, N., Bell, A., Kole, A., Rodkin, A., Dobson, P.F., Jung, Y., and Xu, T. (2013) Experimental study of rock-fluid interactions using automated multi-channel system operated under conditions of CO₂-based geothermal systems. *Proceedings, 38th Workshop on Geothermal Reservoir Engineering*, Stanford University, Feb. 11-13, 2013.
18. Oldenburg, C.M., Doughty, C., Peters, C.A., and Dobson, P.F. (2012) Simulations of upward leakage of CO₂ in long-column flow experiments: Effect of lateral boundary condition. *Proceedings, TOUGH Symposium 2012*, Lawrence Berkeley National Laboratory, Berkeley, CA, Sept. 17-19, 2012.
19. Zhang, Y., Pan, L., Dobson, P., Oglesby, K., and Finsterle, S. (2012) Simulating microhole-based heat mining from enhanced geothermal systems. *Proceedings, TOUGH Symposium 2012*, Lawrence Berkeley National Laboratory, Berkeley, CA, Sept. 17-19, 2012.
20. Xu, T., Dobson, P.F., and Petro, M. (2012) The solubility and kinetics of minerals under CO₂-EGS geothermal conditions: Comparison of experimental and modeling results. *Geothermal Resources Council Transactions* **36**, 589–595.
21. Dobson, P.F., Matthews Seperas, D., Walters, M., Howarth, C., and Moulton, S. (2012) Calpine geothermal visitor center upgrade project – An interactive approach to geothermal outreach and education at The Geysers. *Geothermal Resources Council Transactions* **36**, 399-405.
22. Zhang, Y., Pan, L., Dobson, P., Oglesby, K., and Finsterle, S. (2012) Microholes for improved heat extraction from EGS reservoirs: Numerical evaluation. *Proceedings, 37th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 30-Feb. 1, 2012.
23. Petro, M., Song, L., Bell, A., Tuganov, A., Parajuly, K., Dobson, P., Xu, T., and Pruess, K. (2012) System and methodology for rapid evaluation of geothermal rock-fluid interactions associated with CO₂-EGS. *Proceedings, 37th Workshop on Geothermal Reservoir Engineering*, Stanford University, Jan. 30-Feb. 1, 2012.
24. Peters, C.A., Dobson, P.F., Oldenburg, C.M., Wang, J.S.Y., Onstott ,T.C., Scherer, G.W., Freifeld, B.M., Ramakrishnan, T.S., Stabinski, E.L., Liang, K., and Verma, S. (2011) LUCL: A facility at DUSEL for large-scale experimental study of geologic carbon sequestration. *Energy Procedia* **4**, 5050–5057.
25. Levy, S., Goldstein, S., Dobson, P.F., Goodell, P., Ku, T.L., Abdel-Fattah, A., Saulnier, G., Fayek, M., and de la Garza, R. (2011) Peña Blanca natural analogue project: Summary of activities. *International High-Level Radioactive Waste Management Conference*, April 10-14, 2011, Albuquerque, NM, American Nuclear Society, 330–341.
26. Brophy, P., Lippmann, M.J., Dobson, P.F., and Poux, B., Eds. (2010) The Geysers geothermal field – Update 1990-2010. *Geothermal Resources Council Special Report* **20**, 237 p.
27. Rutqvist, J., Dobson, P.F., Oldenburg, C.M., Garcia, J., and Walters, M. (2010) The Northwest Geysers EGS demonstration project Phase I: Pre-stimulation coupled geomechanical modeling to guide stimulation and monitoring plans. *Geothermal Resources Council Transactions* **34**, 1243–1250.
28. Rutqvist, J., Oldenburg, C.M., Dobson, P.F., Garcia, J., and Walters, M. (2010) Predicting the spatial extent of injection-induced zones of enhanced permeability at the Northwest Geysers EGS demonstration project.

- Proceedings of the 44th U.S. Rock Mechanics Symposium*, Salt Lake City, UT, USA, June 27-30, 2010: American Rock Mechanics Association, Paper No. 10-502.
29. Blank, J.G., Dobson, P.F., and Blake, D.F. (2007) Ophiolites as Mars Analog Sites, *2nd International Workshop - Exploring Mars and its Earth Analogues*, June 19-23, 2007, Trento, Italy (<http://irsps.sci.unich.it/education/mars07/form/2abstract.php?read+100>)
 30. Cortis, A., Dobson, P., and Liu, H.H. (2007) Book review (Understanding the micro to macro behaviour of rock-fluid systems, ed. R.P. Shaw) for *Journal of Sedimentary Research*, Online edition (http://www.sepm.org/jsr/book_revs/2007_revs/br_shaw.pdf).
 31. Dobson, P., Sonnenthal, E., Kennedy, M., Van Soest, T., and Lewicki, J. (2006) Temporal changes in noble gas compositions within the Aidlin sector of The Geysers geothermal system. *Geothermal Resources Council Transactions* **30**, 903–907.
 32. Dobson, P., Sonnenthal, E., Lewicki, J., and Kennedy, M. (2006) Evaluation of C-14 as a natural tracer for injected fluids at the Aidlin sector of The Geysers geothermal system through modeling of mineral-water-gas reactions. *Proceedings, TOUGH Symposium 2006*, LBNL, Berkeley, CA, May 15-17, 2006.
 33. Fayek, M., Ren, M., Goodell, P., Dobson, P., Saucedo, A., Kelts, A., Utsunomiya, S., Ewing, R.C., Riciputi, L.R., and Reyes, I. (2006) Paragenesis and geochronology of the Nopal I uranium deposit, Mexico. *Proceedings, 2006 International High Level Radioactive Waste Management Conference*, April 30-May 4, 2006, Las Vegas, NV, American Nuclear Society, La Grange Park, IL, pp. 55–62.
 34. Paces, J.B., Neymark, L., Ghezzehei, T.A., and Dobson, P.F. (2006) Testing the Concept of Drift Shadow at Yucca Mountain, Nevada. *2006 International High Level Radioactive Waste Management Conference*, April 30-May 4, 2006, Las Vegas, NV, American Nuclear Society, La Grange Park, IL, pp. 278–285.
 35. Ghezzehei, T.A., Dobson, P.F., Rodriguez, J.A., and Cook, P.J. (2006) Infiltration and Seepage through Fractured Welded Tuff. *2006 International High Level Radioactive Waste Management Conference*, April 30-May 4, 2006, Las Vegas, NV, American Nuclear Society, La Grange Park, IL, pp. 105–110.
 36. Spycher, N., Sonnenthal, E., Kneafsey, T., and Dobson, P. (2004) An integrated approach to predict coupled processes at a nuclear waste repository. *11th International Symposium on Water-Rock Interaction*, eds. R.B. Wanty and R.R. Seal II, Saratoga Springs, New York. June 25-July 2, 2004, v. 2, pp. 995–998.
 37. Dobson, P.F., Salah, S., Spycher, N., and Sonnenthal, E. (2003) Simulation of water-rock interaction in the Yellowstone geothermal system using TOUGHREACT. *Proceedings, TOUGH symposium 2003*, LBNL, Berkeley, CA, May 12-14, 2003.
 38. Urzua, L., Powell, T., Cumming, W.B., and Dobson, P. (2002) Apacheta, a new geothermal prospect in Northern Chile. *Geothermal Resources Council Transactions* **26**, 65–69.
 39. Dobson, P., Hulen, J., Kneafsey, T.J., and Simmons, A. (2001) Permeability at Yellowstone: A natural analog for Yucca Mountain processes. *Proceedings, 9th International High-Level Radioactive Waste Management Conference*, April 29-May 3, 2001, Las Vegas, NV, American Nuclear Society, La Grange Park, IL.
 40. Dobson, P., Hulen, J., Kneafsey, T.J., and Simmons, A. (2001) The role of lithology and alteration on permeability and fluid flow in the Yellowstone geothermal system, Wyoming. *Proceedings, 26th Workshop on Geothermal Reservoir Engineering*, Stanford University, 29-31 January 2001.
 41. Furry, S., Gunderson, R., and Dobson, P. (1996) Slim-hole exploration in North Sumatra, Indonesia. In *Proceedings, Slimhole Technology Workshop*, Sandia National Laboratories and the Geothermal Resources Council, Reno NV, July 22-24, 1996.
 42. Gunderson, R.P., Dobson, P.F., Sharp, W.D., Pudjianto, R., and Hasibuan, A. (1995) Geology and thermal features of the Sarulla Contract Area, North Sumatra, Indonesia. *Proceedings, World Geothermal Congress, 1995*, v. 2, 687–692.

LBNL AND DOE REPORTS

1. Perry, F.V., Kelley, R.E., Lugo, A.B., Birdsell, S.M., Dobson, P., Houseworth, J.E. (2014) Database for regional geology, Phase I – A tool for informing regional evaluations of alternative geologic media and decision making. DOE Fuel Cycle Research and Development, FCRD-UFD-2014-000067, 232 p.
2. Dobson, P., and Houseworth, J. (2014) Inventory of Shale Formations in the US, Including Geologic, Geochemical, Hydrological, Mechanical, and Thermal Characteristics, FCRD-UFD-2014-000512, 71 p.
3. Perry, F.V., Kelley, R.E., Dobson, P.F., and Houseworth, J.E. (2014) Regional geology: A GIS database for alternative host rocks and potential siting guidelines. DOE Fuel Cycle Research and Development, FCRD-UFD-2014-000068, 154 p.
4. Dobson, P., and Houseworth, J. (2013) Inventory of Shale Formations in the US Including Geologic, Hydrological, and Mechanical Characteristics. DOE Fuel Cycle Research and Development, FCRD-UFD-2014-000513, 78 p.
5. Perry, F., Kelley, R., and Dobson, P. (2012) Regional geology: Distribution of alternative host rock formations and description of siting factors that potentially influence siting and site characterization activities. DOE Fuel Cycle Research and Development, FCRD-UFD-2012-000503, 69 p.
6. Dobson, P. (2012) Status of shale geology: Information on extent, thickness and depth of shale deposits. DOE Fuel Cycle Research and Development, FCRD-UFD-2012-000296, 26 p.
7. Dobson, P. (2011) Survey of clay/shale formations in the US. In: FY Report on Unsaturated Flow and Transport. DOE Fuel Cycle Research and Development, FCRD-USED-2011-000296, pp. 9-30.
8. Dobson, P.F., and Salve, R. (2009) Underground reconnaissance and environmental monitoring related to geologic CO₂ sequestration studies at the DUSEL facility, Homestake mine, South Dakota, LBNL Report 2858E, November 2009, 17 pp.
9. Dobson, P.F., Cook, P.J., Ghezzehei, T., Rodríguez, J.A., and de la Garza, R., (2008) Heterogeneous seepage at the Nopal I uranium mine, Chihuahua, Mexico, LBNL Report-34E, February 2008, 1 pp.
10. DePaolo, D.J., Orr, F.M. Jr., Benson, S.M., Celia, M., Felmy, A., Nagy, K.L., Fogg, G.E., Snieder, R., Davis, J., Pruess, K., Friedmann, J., Peters, M., Woodward, N.B., Dobson, P., Talamini, K., and Saarni, M. (2007) Basic Research Needs for Geosciences: Facilitating 21st Century Energy Systems. Report from the workshop held Feb. 21-32, 2007. Office of Basic Energy Sciences, U.S. Department of Energy.
11. Dobson, P. and Nakagawa, S. (2005) Summary of Rock-Property Measurements for Hong Kong Tuff Samples, LBNL Report 58878, September 2005, 7 pp.
12. Onishi, C.T., Dobson, P., and Nakagawa, S. (2004) Summary of Test Results for Daya Bay Rock Samples, LBNL Report 57642, October 2004, 6 pp.
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